

Analysis

Citizens' Acceptance of Climate Change Adaptation and Mitigation: A Survey in China, Germany, and the U.S.

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ABSTRACT

The ambitious goals to limit global warming can only be reached with a broad acceptance and participation of the general public. This paper relies on surveys among citizens in China, Germany and the U.S. and investigates the determinants of the acceptance of national and international adaptation and mitigation efforts. The empirical findings indicate that specific beliefs and environmental awareness are important drivers in all three countries, while political attitudes and socio-economic characteristics are the main sources of cross-country heterogeneity. The study thereby points at important starting points and target groups for raising the acceptance of national and international climate policy.

1. Introduction

In November 2016, the Paris Agreement (UNFCCC, 2015) to address climate change officially entered into force. This is celebrated as a landmark achievement worldwide, but for the international community the concrete implementation of the agreement in order to reach the associated emission abatement targets will be the greatest challenge. Undoubtedly, comprehensive changes in economies and societies are necessary worldwide, which can only be realized with a broad acceptance and participation of both public and private actors. However, the scientific society doubts that achieving an agreement on international climate policy can still lead to lasting climate stability (e.g., IPCC, 2013). Thus, public and private actors cannot rely on climate change mitigation only, but additionally need to turn towards adaptation measures in order to cope with the unpreventable impacts of global warming (e.g., Klein et al., 2005; Stern, 2008; Aakre and Rübbecke, 2010).

This paper focuses on the group of citizens and empirically analyzes their acceptance of national and international climate policies. Specifically, I investigate the determinants of the acceptance of allocating national budgets to climate change adaptation (e.g., protection against natural events such as the building of dams or safeguarding of traffic routes) and mitigation measures (measures to reduce global greenhouse gas emissions) as well as of the perceived importance of these measures as issues in international climate negotiations.

In this respect, climate change adaptation is defined as response to the perceived or expected negative effects of climate change in order to

circumvent damages or exploit beneficial opportunities (e.g., IPCC, 2007; Hisali et al., 2011). This includes all efforts that are supposed to reduce the sensitivity and exposure, and increase the resilience to cope with the consequences of climate change (e.g., Yohe and Tol, 2002). Climate change mitigation includes all measures that help abating greenhouse gas (GHG) emissions (e.g., investments in the development of renewable energies or in increasing energy efficiency). While adaptation can be characterized as private or club good, mitigation measures are rather pure or impure public goods involving the well-known information and incentive problems (e.g., Nordhaus, 2006). Adaptation measures that decrease the severity of potential climate-related damages might therefore appear as the more attractive alternative (e.g., Tol, 2005; Onuma and Arino, 2011; Barrett, 2011) given the limited resources of each country.

For the success of national and international climate policy citizens' acceptance of allocating national budgets towards adaptation and mitigation measures is crucial. This acceptance and willingness to pay (WTP) for public adaptation and mitigation efforts is subject of a growing literature. Johnson and Nemet (2010) and Alló and Loureiro (2014) provide a comprehensive collection of these studies. For the acceptance of both adaptation and mitigation policies, age, gender, income, education, and environmental beliefs are identified as important determinants (Johnson and Nemet, 2010). In addition, political views and the perceived engagement of others in climate protection play an important role for the acceptance of public climate change mitigation, which has also been confirmed in more recent studies (e.g., Kotchen et al., 2013). Carlsson et al. (2012) add an international

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dimension to this literature by comparing these determinants for individuals in Sweden, China and the U.S. Their analyses reveal WTP estimates that are highest for Sweden and lowest for China with significant differences in the determinants.

This paper takes up the international dimension by considering citizens from China, Germany and the U.S. and their acceptance of national and international climate policy. The three countries were selected, because they are all large emitters and supposed to play a key role in future international climate policy. The analyses are based on survey responses of approximately 3400 citizens in the three countries and include various indicators that capture their beliefs about climate change, climate protection, and other countries' contributions, options for financing additional climate protection, their environmental awareness and political attitudes as well as socio-economic and socio-demographic characteristics.

The empirical findings suggest that the beliefs and environmental awareness are important drivers for the acceptance of climate policy in all three countries, while political attitudes and socio-economic characteristics are the main sources of cross-country heterogeneity. The study provides important insights into the determinants of the acceptance of national and international climate policy measures in the three countries. It thereby points at valuable starting points for raising this acceptance, which is crucial for reaching the ambitious climate policy goals, agreed on by the international community.

The paper proceeds with a description of the data in [Section 2](#). [Section 3](#) provides the analytical framework, before [Section 4](#) discusses the empirical findings. [Section 5](#) summarizes the results and draws conclusions.

2. Survey Administration and Description of the Data

The data for the following analyses were collected in almost identical web-based surveys which were conducted simultaneously in China, Germany and the U.S. in May and June 2013. In Germany and the U.S., the market research company GfK SE (Gesellschaft für Konsumforschung) drew a representative sample from their online panels. Respondents were invited via email to attend a self-administered questionnaire in a web-based online environment.

In China, an online-survey would probably lead to a systematic bias because internet access is typically lacking in rural areas and market research is less common than in Western countries. Therefore, participants were recruited by employees of GfK China in eleven core regions¹ and invited to centrally located test studios. In the test studios, respondents answered the survey questions without any interference by the GfK employees who were intensively briefed. Although this survey method differs from the online-in-home method in Germany and the U.S., it carefully tried to avoid biases due to regional conditions and interference to make the responses and results comparable across the three countries.

In all three countries, survey questions were developed together with a group of experts in the field of climate change adaptation and mitigation and also carefully pretested by these experts as well as a group of ordinary respondents in order to avoid ambiguity and misunderstandings. The questionnaire comprised five sections including the respondents' general personal beliefs regarding climate change, their own adaptation and climate-friendly activities, specific attitudes towards international climate policy and negotiations, their world view and values, as well as socio-economic and socio-demographic information. On average, the completion of the survey required about 30 min in all three countries. In total, 1430 Chinese, 1005 German, and 1010 U.S. respondents completed the questionnaire. The number of respondents included in the analyses below, however, is smaller for two

reasons. First, deniers of climate change were excluded from the ordered probit analysis (see discussion below). Second, each survey question involved a 'don't know/no answer' option in order to distinguish neutral from unsure responses and to address potential problems of central tendency and social desirability (see also [Table 2](#)).²

Before eliciting the acceptance of national and international climate policies, the problem of climate change was introduced³ and respondents were asked about their belief in global climate change. In order to circumvent potential distortions of the responses, respondents who selected the options 'Global climate change is not going to occur at all' and 'don't know/no answer' were not asked about their acceptance of climate policy, since they don't believe in climate change anyways. These respondents (i.e., 1.89% or 27 respondents from China, 9.95% or 100 respondents from Germany, and 21.19% or 214 respondents from the U.S.)⁴ were not considered in the ordered response analysis and treated as a separate category in the multinomial response analysis (see discussion below).

Respondents who, in contrast, believe that 'Global climate change is already occurring' or 'Global climate change is not happening now, but it will occur in the future' were then asked:

In response to the foreseeable global climate change two strategies are conceivable: Mitigating climate change by reducing the emission of greenhouse gas (e.g. carbon dioxide, methane) through climate protection measures, on the one hand, or adaptation measures to the consequences of climate change, on the other hand.

In your opinion, how strongly should these two responses be pursued by public authorities in China [Germany, the United States]?⁵

Respondents indicated their acceptance of (i) 'mitigation of climate change (e.g. advancement of renewable energy or energy-efficient technologies)' and (ii) 'adaptation measures relating to the consequences of climate change (e.g. provide protection against natural events like the building of dams, safeguarding of traffic routes)' on a symmetric scale with five ordered categories (i.e. 'very weakly', 'rather weakly', 'neither weakly nor strongly', 'rather strongly', and 'very strongly').

The distribution of responses is shown in [Fig. 1](#) in [Appendix B](#). For adaptation, these distributions look very similar in China and Germany. Here, more than two thirds of the respondents agree to the pursuit of adaptation measures by public authorities in their home country. In the U.S., this share is about 20 percentage points smaller and 'don't know' responses occur more frequently. Similarly, the agreement to pursuing mitigation measures is with around three quarters of the respondents very high in China and Germany, and the share of respondents who indicate 'very strongly' is significantly higher compared to adaptation measures.

Regarding international climate negotiations, the survey (among others) involved the following question:⁶

How important do you consider the following issues to be for international climate negotiations?

The perceived importance of (i) 'measures to reduce global

² For most of the questions that I used for the analyses the group of 'don't know/no answer' responses was large enough that I could include them in the analyses as a separate category. Only for a few questions such as education and political attitudes this was not possible. Overall, however, less than 50 observations were removed from the analyses due to missing answers in each country.

³ The exact wording of this introduction was: 'In the following climate change is understood to be a rise in the average global temperature over the past 150 years or in the future, resulting in weather and climate changes.'

⁴ For more details on the climate change beliefs see [Ziegler \(2017\)](#). Further analyses for China can, for example, be found in [Dai et al. \(2015\)](#).

⁵ Respondents were only asked about pursuing the two responses in their own country, not in the other two countries.

⁶ For further results on citizens' beliefs about international climate negotiations see [Schleich et al. \(2016\)](#).

¹ i.e. Beijing, Shanghai, Guangzhou, Shenyang, Wuhan, Chengdu, Shijiazhuang, Hefei, Lanzhou, Yinchuan, and Quanzhou.

greenhouse gas emissions' and (ii) 'adaptation measures to the consequences of climate change (e.g. dams for flood protection)' was again measured on a symmetric scale with five ordered categories (i.e. 'very unimportant', 'rather unimportant', 'neither important nor unimportant', 'rather important', and 'very important').

The distribution of these responses is shown in Fig. 2. In China, the distributions are very similar to national climate policies. For adaptation, the distribution of responses looks very similar in Germany and the U.S. (except for the lower share of don't know responses and climate change deniers in Germany). The share of respondents who consider mitigation as an important issue in international climate negotiations is slightly higher in all countries compared to pursuing national mitigation measures. In Germany, a much higher share of respondents consider mitigation measures as a very important issue in international climate negotiations. Noticeably, the shares of neutral responses (response category 3) from U.S. respondents are significantly smaller compared to responses for national climate policy in Fig. 1.

3. Analytical Framework

For the investigation of the acceptance of national and international climate policy I first apply ordered probit models and estimate the determinants of choosing the highest categories 'very strongly' and 'very important' for adaptation and mitigation efforts, respectively. I use a bivariate approach in order to allow for potential correlations in the respective error terms.⁷ The underlying latent acceptance of respondent i ($i = 1, \dots, n$) who chooses among the $j = 1, \dots, 5$ response categories can be specified as

$$y_{ij}^* = \beta'_{j1} b_i + \beta'_{j2} a_i + \beta'_{j3} x_i + \varepsilon_{ij} \text{ with } y_i = m \text{ if } \kappa_{m-1} < y_{ij}^* < \kappa_m$$

where κ_m ($m = 1, \dots, 5$) is the upper bound threshold for the discrete level y_i . The vector $b_i = (b_{i1}, \dots, b_{ik_1})'$ comprises the respondents' beliefs about climate change, climate change mitigation and the contributions of other countries. The vector $a_i = (a_{i1}, \dots, a_{ik_2})'$ involves indicators for the respondents' environmental and political attitudes. Socio-economic and socio-demographic characteristics are captured in vector $x_i = (x_{i1}, \dots, x_{ik_3})'$. The stochastic component ε_{ij} comprises all unobserved factors and is assumed to follow the standard normal distribution.

As a robustness check, I additionally apply multinomial logit (MNL) models by constructing three mutually exclusive alternatives: (i) neutral and low acceptance (response categories 1, 2, and 3) which serves as the base, (ii) high acceptance (response categories 4 and 5) which is denoted as high acceptance of adaptation (HAA) and high acceptance of mitigation (HAM) in Tables 3 to 5, as well as (iii) the climate change deniers (CCD). The comparison between the base category and respondents with a high acceptance corresponds to a binary response analysis, while the inclusion of the third category of climate change deniers helps distinguishing between respondents who are not in favor of certain policy measures and those who completely deny the phenomenon of climate change.

The microeconomic motivation of the MNL model is that respondent i can choose among the three mutually exclusive alternatives. The underlying unobservable utility function for respondent i ($i = 1, \dots, n$) and alternative $j = 1, 2, 3$ is:

$$u_{ij} = \beta'_{j1} b_i + \beta'_{j2} a_i + \beta'_{j3} x_i + \varepsilon_{ij}.$$

According to the stochastic utility maximization hypothesis, i chooses alternative j if the corresponding utility the largest among all possible alternatives. The error terms ε_{ij} comprise all unobservable factors and are independently and identically extreme value distributed. In the following, I discuss the explanatory variables and

present the exact question wordings in Table 1 in Appendix A.

Two important conditions for the acceptance especially of climate change mitigation are the beliefs that human activities are partly or fully responsible for climate change and that climate change can still be limited by climate protection measures. I include the binary indicators *humans responsible* and *limit climate change* to capture these beliefs. Both should be positively correlated with the acceptance of national and international climate change mitigation (see e.g., Carlsson et al., 2012) (hypothesis 1). A positive attitude towards climate change mitigation, such as the belief in secondary benefits, should further increase the acceptance of those efforts. The belief that climate protection measures have a positive impact on the economy might, for instance, mirror such a positive attitude. Thus, I include the binary variable *positive impact on economy* and expect a positive correlation with the acceptance of national and international mitigation efforts (hypothesis 2).

Furthermore, the perceptions of the climate change mitigation efforts of others might be crucial for the acceptance of national and international climate policy. Experimental evidence indicates that individuals are conditional contributors, i.e. more willing to contribute to public goods if others participate as well (Kocher et al., 2008; Fischbacher and Gächter, 2010; Khadjavi and Lange, 2013). In line with these findings, the belief that most countries do too little for protecting the climate might be negatively correlated with the acceptance of national climate change mitigation, but positively with international efforts (hypothesis 3). In contrast, this belief might also trigger the desire to act as an example which has been shown to be an important motive for private climate-friendly activities (Schwirplies and Ziegler, 2016). A perceived lack in climate protection efforts by others might at the same time raise the acceptance of adaptation measures (hypothesis 4) in order to reduce potential damages due to the negative consequences of climate change. For China, this belief variable cannot be included because the underlying question was not asked in the survey due to political restrictions.

Particularly relevant for policy is the question how to finance additional climate policy measures. I include two variables that reflect this issue. First, the binary variable *pay higher prices* indicates whether respondents are willing to pay higher prices for products and services that are better for the climate. In addition, the binary variable *finance by national budget* reflects the respondents' agreement to (re)allocating national budgets towards additional climate protection measures. The latter question could again not be asked in China. Ideally, both variables are positively correlated with the acceptance of pursuing national mitigation measures indicating that respondents are aware and willing to accept that climate change mitigation entails economic costs for society.⁸ I further control for environmental awareness using a short version of the NEP scale (Dunlap et al., 2000), which is a standard scale in psychology. In Germany and the U.S., the binary variables *conservative*, *green*, *social*, and *liberal* reflect the respondent's political attitudes. The binary variable *communist party* indicates that a Chinese respondent is a member of the communist party.

Finally, I include several indicators for the socio-demographic and socio-economic status of the respondent, i.e. a dummy for an individual net income above the median income in the sample (in order to make the responses comparable across countries), a dummy for a higher educational level, the age of the respondent in years, a gender dummy for female respondents, the number of the respondent's own children, and several regional controls. In line with former studies (see the discussion in the Introduction), I expect age, being female, and income to be positively correlated with the acceptance of climate change adaptation, but potentially negatively with mitigation efforts. However, as Carlsson et al. (2012) already demonstrated for mitigation, these

⁷ Although the correlations in the error terms are significantly different from zero in all three countries, parameter estimates and estimated standard deviations are very similar to those in the standard ordered probit models.

⁸ Please note that I cannot rule out that the two variables are endogenous, i.e. determined by the same unobserved factors as the dependent variable. Still, removing them from the regression does not change the estimation results for the other explanatory variables.

correlations might be highly heterogeneous across the three countries.

4. Results

4.1. Descriptive Statistics

Descriptive statistics for the whole and the estimation samples in the ordered probit analysis are presented in Table 2. Although some observations are not used in the ordered probit analyses due to the denial of climate change or missing answers especially in Germany and the U.S., the figures are very similar for both samples. Particularly in the U.S. sample, deviations are partly larger because of the higher share of respondents who doubt climate change. Logically, these deviations are highest for the beliefs about climate change and climate change mitigation as well as the preferences for financing mitigation measures.

The descriptive statistics also reveal some striking differences between the three countries. Regarding the estimation sample of the ordered probit analysis that involves only individuals who believe in climate change, almost all of these Chinese and German respondents believe that human activities are fully or partly responsible for climate change, while about 10% of the U.S. respondents completely deny human influence. Only 53% of the German and U.S. respondents think that climate change can still be limited by climate protection measures. Chinese respondents are much more confident with 84%. Only half of the respondents in Germany and the U.S. believe in a positive impact of climate protection measures on the economy. In China, this share is again much higher with 78%. German respondents are particularly critical about the contributions of other countries as 79% think that most countries do too little for climate protection. In the U.S., this share is clearly smaller with 62%, but still relatively high.

Although environmental awareness is highest in Germany (followed by China and the U.S.), only 44% of German respondents are willing to pay higher prices for products and services that are better for the climate. This willingness is even lower for U.S. respondents (34%), but remarkably higher in China (81%). However, this question is subject to considerable uncertainty with about one quarter of German and U.S. respondent specifying ‘don’t know/no answer’. The agreement to financing additional climate protection measures by national budget is remarkably higher in Germany 77% with lower uncertainty (10%). In the U.S., the agreement is also clearly higher (compared to the willingness to pay higher prices for climate-friendly products) with 54%, but the uncertainty is still very high (23%).

4.2. Estimation Results

Tables 3 to 5 report the estimation results for the acceptance of pursuing national adaptation and mitigation measures (first five columns) and the importance of adaptation and mitigation as issues in international climate negotiations (last five columns). I focus my discussion of the empirical findings on the bivariate ordered probit models including the effect sizes for the main results. The estimated correlations in the error terms (ρ) of adaptation and mitigation measures are significantly positive in all three countries and highest in the U.S. Accordingly, the Wald test of the null hypothesis that the two equations for the acceptance of adaptation and mitigation efforts are independent is rejected at all common significant levels. In addition, I point out the significant differences to the estimation results from the MNL models regarding the binary response analysis of the two categories of high acceptance versus the categories of neutral and low acceptance.

The respondents’ beliefs about climate change, climate protection and other countries’ efforts seem to be important predictors of the acceptance of national and international climate policy in all three countries. In China, all three belief variables are significantly positively correlated with considering mitigation as a very important issue in international climate negotiations. The belief that climate change can still be limited by climate protection measures is, however, only relevant for

the probability of choosing the highest category of the perceived importance of international mitigation effort. In the MNL model, where the two highest response options ‘rather important’ and ‘very important’ are pooled for a binary comparison with the other three response categories, the parameter estimate is not significantly different from zero. In addition, Chinese respondents who believe that climate protection measures have a positive impact on the economy have a higher acceptance of national mitigation efforts.

In Germany, all four belief variables are significantly positively correlated with a very high acceptance of national and international mitigation measures.⁹ The same holds for the U.S., except for the belief that climate change can still be limited by climate protection measures. This belief does not seem to be relevant at all for U.S. respondents’ acceptance of national and international climate policy. In China and Germany, the belief that humans are partly or fully responsible for climate change and that climate change can still be limited are additionally associated with a lower probability of being a climate change denier. For the other two belief variables the comparison between climate change deniers and respondents with a low acceptance of the climate policies is ambiguous. In the U.S., only respondents who believe in a positive impact on the economy are clearly less likely to be climate change deniers.

Overall, however, the included beliefs seem to be most relevant for the acceptance of mitigation efforts by the international community in all three countries, but also by national authorities especially in Germany (in line with hypotheses 1 and 2). The significant parameter estimates correspond to an increase in the probability that a policy measure is very highly accepted of around 10 percentage points. The beliefs in positive co-benefits for the economy (especially in China with a discrete effect of 17 percentage points) and in lacking efforts of other countries (especially in Germany with a discrete effect of 16 percentage points on international efforts) are the strongest drivers for national and international mitigation efforts. The latter finding partly contradicts hypothesis 3 that individuals are conditional contributors. Respondents seem to be rather motivated by the perceived lack in climate protection efforts. One potential explanation might be the desire to act as an example, as discussed above.

Some beliefs are additionally correlated with a high acceptance of adaption measures. I find significantly positive parameter estimates for *limit climate change* in China and Germany. That is, even though these respondents are more optimistic about the effectiveness of climate protection activities, they are more likely to have a very higher acceptance of national and international adaptation efforts. In Germany, these correlations, however, diminish in the MNL models. I further find a significantly positive correlation between *positive impact on economy* and national and international adaptation efforts in China and the U.S., both also robust in the MNL model. This might indicate that an unobserved factor drives these beliefs and at the same time the acceptance of adaptation resulting in the detected positive correlations in the error terms. As expected in hypothesis 4, the belief that other countries do too little for climate protection triggers U.S. respondents’ acceptance for national adaptation measures by about 10 percentage points. For Germany, the findings in the MNL models indicate a highly significant correlation (about 8 percentage points) between this belief and a high importance of international adaptation measures.

Interestingly, Chinese and U.S. respondents who indicated that they are willing to pay higher prices for climate-friendly products and services solely attach a greater importance to mitigation as an issue in international climate negotiations (about 12 percentage points in all countries). Only the corresponding German respondents also exhibit a higher acceptance of national mitigation efforts (9 percentage points).

⁹ The correlation of the belief in a positive impact on the economy and the importance of international mitigation efforts is, however, not significantly different from zero in the MNL models.

In Germany, however, the 21% unsure respondents in the estimation sample are also significantly more likely to strongly support national (6 percentage points) and international (12 percentage points) mitigation efforts. Both relationships as well as the correlation between the willingness to pay higher prices and a high acceptance of national mitigation measures cannot be detected in the MNL models.

Respondents in Germany and the U.S. who agree to finance these measures by national budget are also more likely to exhibit a higher acceptance for these mitigation measures (18 percentage points in Germany and 15 in the U.S.). In the U.S., agreeing and uncertain respondents further attach a higher importance to international adaptation and mitigation efforts (around 15 percentage points). Altogether, these findings suggest strong positive correlations between the acceptance of mitigation measures and being willing to pay higher prices or financing these measures by national budgets in Germany, while such a correlation can only be detected for financing mitigation measures by national budget in the U.S.

Regarding the respondents' environmental and political attitudes, a higher environmental awareness has a significantly positive effect on the acceptance of national and international mitigation efforts in all three countries, just as for the respondents' personal climate-friendly activities (see Schwirplies and Ziegler, 2016; Lange et al., 2017). Effect sizes range between 5 and 7 percentage points for a discrete change of one, translating to about 35 and 50 percentage points for a discrete change from the lowest to the highest level of environmental awareness on average. Being a member of the communist party in China is associated with a significantly higher acceptance of pursuing national adaptation and mitigation measures, but not with considering these two issues as very important in international climate negotiations.

In the other two countries, political attitudes are subject to much heterogeneity in the acceptance of climate policy. In both countries, conservative respondents seem to be more likely to be climate change deniers (CCD in the MNL models) which is in line with former studies on climate change beliefs (e.g., Ziegler, 2017), and attach a very high importance to international adaptation efforts in the U.S. Identifying with green politics significantly increases the acceptance of national mitigation and decreases the likelihood for perceiving a very high importance of international adaptation efforts in Germany. A social political attitude increases the perceived importance of mitigation as well as a very high importance of adaptation (not significant in the MNL model) in international climate negotiations by German respondents.

The estimation results also reveal considerable differences in the socio-economic characteristics between the three countries. A higher income is associated with a higher preference for adaptation in China, but a lower acceptance of pursuing national adaptation and mitigation measures in Germany. A higher income is also associated with a higher likelihood of being a climate change denier in China, but a lower corresponding likelihood in the other two countries. A higher educational level increases the acceptance of international mitigation measures in China, but reduces the perceived importance of international adaptation efforts in Germany. Also, highly educated respondents are less likely to be climate change deniers in China, but more likely in Germany. In the U.S., the signs of the parameter estimates are ambiguous.

Older respondents are more likely to support national and international adaptation measures and international mitigation and are less likely to be climate change deniers in Germany. In the U.S., a higher age is associated with a higher acceptance of pursuing both measures at the national and international level.¹⁰ In China, age and gender have almost no significant impact except for older respondents who are more likely to be climate change deniers, while female respondents from Germany and the U.S. are more likely to support adaptation. The

positive relationship between *age* and *female* and the acceptance of adaptation in Germany and the U.S. is in line with former studies on the individual adaptation activities (e.g., Osberghaus, 2015; Schwirplies and Ziegler, 2017). Women from the U.S. further attach a higher importance to mitigation as an issue in international climate negotiations. The number of own children increases the acceptance of national adaptation and decreases the likelihood of being a climate change denier in China.

5. Summary and Conclusions

This study sheds light on the determinants of the acceptance of national and international climate change adaptation and mitigation policies in a cross-country analysis. The analyses rely on data from surveys which were conducted simultaneously in China, Germany and the U.S.

The empirical findings indicate that the respondents' beliefs and environmental awareness are important drivers of the acceptance of national and international mitigation efforts in all three countries. In particular, environmental awareness, the belief in positive co-benefits of climate protection measures as well as the perception of lacking climate protection efforts by other countries have strong positive effects. Beliefs reported by the respondents in the survey might, however, be affected by their desire to match their own climate-friendly behaviors and the tendency to justify existing (e.g., economic, industrial, or cultural) systems (see e.g. McCright and Dunlap, 2011). Respondents may thereby try to avoid a cognitive dissonance (see Festinger, 1957).

The determinants of the acceptance of mitigation efforts, however, significantly differ between the three countries regarding political attitudes and socio-economic characteristics. In China, being a member of the communist party slightly increases the acceptance of national mitigation measures, but none of the socio-economic characteristics seems to play a role. In Germany, identifying with green politics and having own children increase the acceptance of national measures, while an income above average decreases the support. Older German respondents with a conservative or social political attitude tend to support mitigation efforts in international climate negotiations. In the U.S., older and green respondents are more likely to accept national measures, while older respondents, women and respondents with a social or liberal political attitude seem to be more in favor of international efforts.

Likewise, the determinants of the acceptance of adaptation measures vary widely across the three countries. In China, being a member of the communist party, an income above average and having own children are associated with a higher acceptance of adaptation, while a higher educational level tends to lower this acceptance. In Germany and the U.S., older respondents and women are more in favor of national and international adaptation efforts. A higher income and educational level as well as the identification with green politics rather seem to dampen this acceptance in Germany. In contrast, German respondents with a social political attitude are more likely to support international adaptation efforts. The latter also applies to conservatives in the U.S., while liberals tend to have a higher acceptance of national adaptation measures.

These findings provide valuable insights into the interrelation between citizens' beliefs and attitudes and their acceptance of climate policy and reveal important starting points for enhancing this acceptance, which is crucial for reaching the ambitious emission abatement targets agreed on in the Paris Agreement. Especially in the U.S., citizens are particularly skeptical about the occurrence and consequences of climate change accompanied by a low willingness to pay higher prices for climate-friendly products or to allocate national budget towards climate protection measures. Just as for private climate-friendly activities, emphasizing the co-benefits of climate protection activities such as the positive effects on the economy, on air quality and health might raise the public awareness for climate change and be an effective

¹⁰ The parameter is not significantly different from zero for national adaptation measure in the MNL models.

approach to increase the acceptance of climate policy measures. Taking a leading role might be another successful strategy in this respect. These results closely relate to the motives for individual climate-friendly activities which are strongly driven by their financial or psychological co-benefits (e.g., Schwirplies and Ziegler, 2016; Lange et al., 2016).

At the same time, the study informs about further determinants of the acceptance of climate policy measures. This knowledge helps addressing certain target groups. Especially women and elderly in Germany and the U.S. seem to favor adaptation efforts, in addition to their higher propensity to take private adaptation measures. Another major difference between respondents in the three countries is the impact of a higher income. While in China the acceptance of adaptation measures is positively correlated with income, Germany respondents with higher income seem to be more inclined to autonomous climate-friendly and adaptation activities (Grothmann and Reusswig, 2006; Lange et al., 2017). Reasons might be a higher flexibility or lacking

trust in public activities, but has to be subject of further research. In contrast, I cannot detect a significant correlation between income and the acceptance of climate policy measures in the U.S.

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Appendix A. Tables

Table 1
Description of explanatory variables.

Variables	Description
Humans responsible	1 if the respondent indicated ‘human activities’ or ‘natural processes as well as human activities’ as response to the question ‘What, in your opinion, is the main cause of climate change?’, 0 otherwise.
Limit climate change	1 if the respondent answered ‘yes’ to the question ‘Do you think that we can still effectively limit climate change by climate protection measures?’, 0 otherwise.
Positive impact on economy	1 if the respondent agreed rather strongly or very strongly to the statement ‘a contribution to climate protection has a positive impact on the economy’, 0 otherwise. ^a
Countries do too little	1 if the respondent agreed rather strongly or very strongly to the statement ‘most countries do too little for climate protection’, 0 otherwise. ^b
Pay higher prices	1 if the respondent answered ‘yes’ to the question ‘Would you be willing to pay higher prices for everyday products or services that offer a comparable quality or performance but are better for the climate than competing products?’, 0 otherwise.
Finance by national budget	1 if the respondent answered ‘yes’ to the question ‘Would you agree to additional climate protection measures being financed by the national budget?’, 0 otherwise.
Communist party	1 if a Chinese respondent stated to belong to the communist party.
Conservative	1 if a German or U.S. respondent agreed rather strongly or very strongly to the statement ‘I am conservative’, 0 otherwise. ^b
Green	1 if a German or U.S. respondent agreed rather strongly or very strongly to the statement ‘I identify myself closest with green politics’, 0 otherwise. ^b
Liberal	1 if a German or U.S. respondent agreed rather strongly or very strongly to the statement ‘I am liberal’, 0 otherwise. ^b
Social	1 if a German or U.S. respondent agreed rather strongly or very strongly to the statement ‘I would describe myself as socially’, 0 otherwise. ^b
High individual income	1 if the individual net income of the respondent is above median category of the sample (i.e. at least ¥ 5000 in China, € 2000 in Germany and \$ 2500 in the USA), 0 otherwise.
Highly educated	1 if the respondent's highest level of education is at least secondary (Senior Middle School in China, Abitur in Germany, College degree in the U.S.), 0 otherwise.
Age	Age of the respondent in years.
Female	1 if the respondent is a woman, 0 otherwise.
Number of own children	Number of own children of the respondent.
Regional dummies for China	Beijing, Shanghai, Guangzhou, Shenyang, Wuhan, Chengdu, Shijiazhuang, Hefei, Lanzhou, Yinchuan, and Quanzhou take the value 1 if respondent lives in the corresponding region in China, 0 otherwise.
Regional dummies for Germany	North, East, South, and West take the value 1 if the respondent lives in a northern (eastern, southern, western) state of Germany, 0 otherwise.
Regional dummies for the U.S.	Northeast, Midwest, South, and West take the value 1 if the respondent lives in the corresponding region in the USA, 0 otherwise.

^a The underlying question is “how strongly do you agree to the following statement” with the five ordered response categories “very weakly”, “rather weakly”, “neither weakly nor strongly”, “rather strongly”, and “very strongly”.

^b Although the correlations in the error terms are significantly different from zero in all three countries, parameter estimates and estimated standard deviations are very similar to those in the standard ordered probit models.

Table 2
Mean (standard deviation) of the main explanatory variables in the whole and estimation samples.

Variables	China		Germany		U.S.	
	Whole sample	Estimation sample	Whole sample	Estimation sample	Whole sample	Estimation sample
Humans responsible						
Yes	0.95 (0.23)	0.97 (0.18)	0.87 (0.33)	0.98 (0.15)	0.69 (0.46)	0.89 (0.32)
Don't know/no answer	0.02 (0.15)	0.00 (0.06)	0.11 (0.31)	0.00 (0.07)	0.23 (0.42)	0.02 (0.13)
Limit climate change						
Yes	0.82 (0.39)	0.84 (0.37)	0.48 (0.50)	0.53 (0.50)	0.41 (0.49)	0.53 (0.50)
Don't know/no answer	0.09 (0.28)	0.06 (0.24)	0.23 (0.42)	0.14 (0.34)	0.42 (0.49)	0.25 (0.43)
Positive impact on economy						
Yes	0.76 (0.42)	0.78 (0.42)	0.43 (0.50)	0.47 (0.50)	0.47 (0.50)	0.56 (0.50)
Don't know/no answer	0.02 (0.15)	0.01 (0.12)	0.08 (0.27)	0.06 (0.24)	0.08 (0.28)	0.05 (0.21)
Countries do too little						
Yes			0.75 (0.43)	0.79 (0.41)	0.54 (0.50)	0.62 (0.49)
Don't know/no answer			0.04 (0.20)	0.03 (0.16)	0.10 (0.30)	0.06 (0.23)
Pay higher prices						
Yes	0.80 (0.40)	0.81 (0.39)	0.41 (0.49)	0.44 (0.50)	0.28 (0.45)	0.34 (0.47)
Don't know/no answer	0.10 (0.30)	0.09 (0.28)	0.24 (0.43)	0.24 (0.43)	0.25 (0.43)	0.26 (0.44)
Finance by national budget						
Yes			0.73 (0.44)	0.77 (0.42)	0.44 (0.50)	0.54 (0.50)
Don't know/no answer			0.11 (0.32)	0.10 (0.30)	0.26 (0.44)	0.23 (0.42)
Environmental awareness						
High awareness	3.53 (1.48)	3.56 (1.46)	3.89 (1.94)	4.06 (1.85)	2.93 (1.93)	3.33 (1.83)
Don't know/no answer	0.02 (0.12)	0.01 (0.10)	0.04 (0.19)	0.02 (0.15)	0.03 (0.18)	0.01 (0.10)
Communist party	0.30 (0.46)	0.31 (0.46)				
Conservative			0.22 (0.42)	0.22 (0.42)	0.38 (0.49)	0.35 (0.48)
Green			0.28 (0.45)	0.30 (0.46)	0.19 (0.39)	0.23 (0.42)
Social			0.40 (0.49)	0.41 (0.49)	0.27 (0.45)	0.31 (0.46)
Liberal			0.70 (0.46)	0.73 (0.45)	0.30 (0.46)	0.32 (0.47)
Income						
High individual income	0.59 (0.49)	0.61 (0.49)	0.42 (0.49)	0.42 (0.49)	0.52 (0.50)	0.55 (0.50)
Don't know/no answer	0.04 (0.20)	0.03 (0.18)	0.18 (0.38)	0.18 (0.38)	0.14 (0.34)	0.10 (0.30)
Highly educated	39.26 (12.47)	39.28 (12.49)	41.13 (12.52)	41.28 (12.52)	48.51 (14.46)	48.77 (14.49)
Age	0.76 (0.42)	0.77 (0.42)	0.55 (0.50)	0.57 (0.50)	0.68 (0.47)	0.70 (0.46)
Female	0.50 (0.50)	0.50 (0.50)	0.49 (0.50)	0.49 (0.50)	0.53 (0.50)	0.52 (0.50)
Own children	0.86 (0.68)	0.87 (0.68)	0.95 (1.12)	0.95 (1.10)	1.32 (1.39)	1.35 (1.39)
Observations	1430	1375	1005	884	1010	741

Table 3
Estimation results for the acceptance of national and international climate policy in China.

Variables	Acceptance of national efforts				Importance in international climate negotiations								
	Bivariate ordered probit models				Multinomial logit models				Multinomial logit models				
	Mitigation	Adaptation	HAM	CCD	HAA	CCD	HAA	CCD	Adaptation	HAM	CCD	HAA	CCD
Humans responsible													
Yes	0.25 (0.15)	−0.14 (0.18)	0.10 (0.35)	−20.23*** (1.28)	0.00 (0.35)	−12.10*** (1.59)			−0.08 (0.14)	0.86** (0.38)	−18.85*** (2.13)	−0.72* (0.40)	−16.48*** (1.36)
Don't know/no answer	0.82** (0.38)	0.45 (0.45)	35.03*** (7.05)	100.25*** (8.91)	0.92 (1.17)	79.44*** (2.09)			0.19 (0.51)	0.40 (1.61)	68.57*** (2.22)	−0.60 (0.97)	68.66*** (2.04)
Limit climate change													
Yes	0.18* (0.10)	0.35*** (0.10)	0.34 (0.22)	−5.66*** (1.06)	0.45** (0.20)	−8.89*** (1.12)			0.38*** (0.11)	0.21 (0.25)	−5.39*** (1.02)	0.75*** (0.20)	−4.27*** (0.72)
Don't know/no answer	0.11 (0.16)	0.25 (0.16)	−0.28 (0.34)	6.36*** (1.26)	0.28 (0.32)	−2.09* (1.11)			0.14 (0.16)	−0.06 (0.46)	8.36*** (1.78)	0.31 (0.33)	3.73*** (1.11)
Positive impact on economy													
Yes	0.26*** (0.08)	0.22*** (0.08)	0.60*** (0.16)	11.24*** (1.06)	0.39** (0.15)	11.20*** (1.02)			0.51*** (0.08)	0.91*** (0.21)	10.24*** (1.13)	0.84*** (0.16)	10.75*** (1.01)
Don't know/no answer	−0.22 (0.34)	−0.17 (0.32)	0.35 (0.65)	−4.02** (1.56)	−0.08 (0.55)	2.34* (1.37)			0.34 (0.26)	1.71* (0.88)	−2.20 (1.87)	0.68 (0.66)	−1.24 (1.20)
Pay higher prices													
Yes	−0.01 (0.10)	−0.06 (0.11)	0.11 (0.22)	−2.98** (1.24)	0.07 (0.21)	2.24*** (0.85)			0.17 (0.10)	0.83*** (0.27)	0.43 (1.21)	0.19 (0.22)	−0.42 (0.93)
Don't know/no answer	0.05 (0.14)	−0.26* (0.14)	0.46 (0.32)	−38.82*** (1.68)	−0.22 (0.28)	−37.94*** (1.50)			0.11 (0.15)	0.97** (0.42)	−37.93*** (1.83)	0.10 (0.30)	−37.73*** (1.58)
Environmental awareness													
High awareness	0.18*** (0.02)	0.02 (0.02)	0.26*** (0.05)	5.96*** (0.41)	0.06 (0.05)	4.65*** (0.33)			0.06*** (0.02)	0.66*** (0.08)	5.61*** (0.55)	0.15*** (0.05)	5.09*** (0.36)
Don't know/no answer	−0.03 (0.34)	−0.14 (0.32)	−0.40 (0.68)	29.41*** (2.49)	0.00 (0.61)	29.10*** (2.17)			−0.70** (0.34)	−0.80 (1.32)	23.37*** (2.72)	−1.44 (1.24)	24.83*** (2.10)
Communist party	0.12* (0.07)	0.18*** (0.06)	0.14 (0.16)	−11.57*** (2.00)	0.47*** (0.15)	−12.29*** (1.93)			0.07 (0.07)	−0.17 (0.22)	−2.00 (1.25)	0.17 (0.15)	−10.95*** (1.77)
Income													
High individual income	−0.01 (0.07)	0.12* (0.07)	0.22 (0.17)	1.72 (1.06)	0.30** (0.15)	6.19*** (0.98)			0.14* (0.07)	0.36 (0.22)	2.18*** (0.73)	0.31* (0.16)	2.41*** (0.67)
Don't know/no answer	0.31 (0.20)	0.00 (0.18)	0.61 (0.44)	8.71*** (0.86)	0.10 (0.35)	10.83*** (1.10)			0.08 (0.18)	0.52 (0.55)	14.08*** (1.17)	0.32 (0.41)	8.67*** (0.88)
Highly educated	0.04 (0.09)	−0.15* (0.08)	0.10 (0.20)	−6.61*** (1.53)	−0.13 (0.17)	2.98*** (1.14)			0.01 (0.08)	0.70*** (0.23)	−3.85*** (1.35)	0.11 (0.18)	−2.58*** (0.87)
Age	−0.00 (0.00)	0.00 (0.00)	−0.00 (0.01)	0.13*** (0.04)	−0.00 (0.01)	0.18*** (0.03)			0.00 (0.00)	0.01 (0.01)	0.19*** (0.04)	0.01* (0.01)	0.13*** (0.03)
Female	0.03 (0.06)	0.04 (0.06)	0.09 (0.14)	0.76 (1.43)	−0.06 (0.13)	0.76 (0.89)			0.10 (0.06)	0.42** (0.20)	−1.59* (0.82)	0.20 (0.14)	−0.68 (0.89)
Own children	0.07 (0.05)	0.15*** (0.05)	0.01 (0.12)	−6.65*** (1.08)	0.22* (0.11)	−5.54*** (1.09)			−0.05 (0.06)	−0.01 (0.23)	−9.20*** (1.34)	−0.10 (0.11)	−5.63*** (0.90)
Regional controls													

Shanghai	– 0.06 (0.12)	– 0.25** (0.11)	0.01 (0.26)	48.50*** (2.79)	– 0.19 (0.23)	64.20*** (2.31)	– 0.20* (0.11)	– 0.11 (0.11)	– 0.13 (0.34)	54.89*** (3.66)	– 0.40 (0.25)	54.43*** (2.44)
Guangzhou	– 0.11 (0.11)	– 0.09 (0.11)	0.05 (0.27)	22.35*** (2.21)	– 0.21 (0.24)	65.97*** (2.60)	0.17 (0.12)	0.11 (0.12)	0.49 (0.37)	55.68*** (4.26)	– 0.00 (0.27)	54.60*** (2.74)
Shenyang	– 0.27** (0.13)	– 0.09 (0.13)	– 0.30 (0.30)	33.86*** (1.81)	– 0.14 (0.28)	40.02*** (1.82)	– 0.06 (0.13)	0.05 (0.13)	– 0.31 (0.36)	54.87*** (3.60)	0.13 (0.31)	53.63*** (2.44)
Wuhan	– 0.24* (0.14)	– 0.18 (0.13)	– 0.42 (0.31)	33.83*** (2.09)	– 0.08 (0.29)	42.79*** (2.82)	– 0.11 (0.14)	– 0.12 (0.13)	– 0.10 (0.44)	43.43*** (3.44)	– 0.24 (0.31)	37.40*** (2.29)
Chengdu	– 0.14 (0.14)	– 0.21 (0.14)	0.00 (0.35)	46.89*** (2.70)	– 0.23 (0.30)	64.01*** (2.36)	– 0.16 (0.16)	0.04 (0.14)	– 0.34 (0.46)	51.85*** (3.85)	– 0.35 (0.32)	52.87*** (2.51)
Shijiazhuang	– 0.06 (0.15)	– 0.22 (0.15)	– 0.12 (0.34)	23.73*** (2.70)	– 0.50* (0.29)	34.23*** (2.72)	– 0.15 (0.17)	– 0.15 (0.14)	– 0.40 (0.45)	48.02*** (3.52)	– 0.49 (0.32)	28.44*** (2.94)
Hefei	– 0.13 (0.12)	– 0.17 (0.14)	0.22 (0.33)	47.93*** (2.99)	– 0.17 (0.30)	69.15*** (2.29)	– 0.33** (0.15)	– 0.09 (0.15)	– 0.40 (0.43)	55.07*** (3.78)	– 0.56* (0.32)	56.46*** (2.63)
Lanzhou	0.04 (0.13)	0.02 (0.12)	– 0.15 (0.29)	18.31*** (2.36)	0.16 (0.27)	33.69*** (2.57)	– 0.04 (0.13)	– 0.00 (0.13)	0.00 (0.42)	13.13*** (3.39)	– 0.08 (0.29)	23.30*** (2.50)
Yinchuan	0.15 (0.15)	– 0.05 (0.13)	0.26 (0.38)	49.02*** (3.81)	0.31 (0.34)	67.40*** (2.31)	0.29* (0.15)	0.08 (0.13)	1.22 (0.79)	61.18*** (3.96)	0.63 (0.40)	57.11*** (2.47)
Quanzhou	– 0.15 (0.15)	– 0.36** (0.15)	– 0.39 (0.32)	21.20*** (3.43)	– 0.49* (0.30)	40.17*** (3.07)	– 0.02 (0.15)	– 0.12 (0.15)	0.21 (0.44)	55.30*** (3.99)	– 0.29 (0.32)	53.29*** (2.28)
Rho/constant	0.58*** (0.04)	0.58*** (0.04)	– 0.62 (0.53)	– 87.20*** (2.54)	– 0.03 (0.50)	– 118.18*** (3.30)	0.58*** (0.04)	0.58*** (0.04)	– 3.59*** (0.64)	– 96.36*** (2.89)	– 0.65 (0.54)	– 95.11*** (2.59)
Observations	1375		1400		1400		1362		1389		1387	

Notes: Maximum likelihood estimates (robust standard errors) of the parameters in bivariate ordered probit and multinomial logit models. In the multinomial logit model, HAM = high acceptance of mitigation, HAA = high acceptance of adaptation, and CCD = climate change deniers.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

Table 4
Estimation results for the acceptance of national and international climate policy in Germany.

Variables	Acceptance of national efforts				Importance in international climate negotiations							
	Bivariate ordered probit models				Multinomial logit models				Multinomial logit models			
	Mitigation	Adaptation	HAM	CCD	HAA	CCD	Mitigation	Adaptation	HIM	CCD	HIA	CCD
Humans responsible												
Yes	0.48* (0.29)	– 0.10 (0.30)	1.10* (0.60)	– 0.98 (1.84)	0.22 (0.55)	– 4.32** (1.83)	0.61*** (0.20)	0.16 (0.31)	1.23** (0.52)	– 3.67* (2.18)	0.16 (0.50)	– 22.52*** (2.10)
Don't know/no answer	1.30* (0.70)	0.52 (0.65)	2.39* (1.32)	66.22*** (2.62)	1.39 (1.23)	55.73*** (2.24)	– 0.58 (0.36)	– 1.51*** (0.43)	– 20.83*** (1.27)	59.66*** (2.22)	– 2.76** (1.17)	70.35*** (2.33)
Limit climate change												
Yes	0.36*** (0.09)	0.23*** (0.08)	0.73*** (0.24)	– 23.23*** (1.64)	0.28 (0.18)	– 18.86*** (1.37)	0.35*** (0.10)	0.24*** (0.09)	1.11*** (0.34)	– 10.92*** (2.40)	0.37* (0.19)	– 14.45*** (3.36)
Don't know/no answer	0.20* (0.12)	0.16 (0.11)	0.70* (0.36)	12.88*** (1.07)	0.46 (0.28)	11.93*** (0.99)	0.25* (0.14)	0.12 (0.12)	0.82* (0.48)	11.18*** (1.28)	0.55* (0.31)	13.31*** (1.62)
Positive impact on economy												

Yes	0.38*** (0.09)	0.08 (0.08)	0.54** (0.24)	1.54** (0.63)	0.12 (0.18)	1.56** (0.62)	0.29*** (0.10)	0.14* (0.08)	– 0.30 (0.32)	1.29 (0.79)	0.32* (0.19)	18.17*** (1.36)
Don't know/no answer	0.28* (0.16)	0.17 (0.16)	0.87 (0.55)	– 1.24 (1.08)	0.32 (0.43)	– 2.37** (0.99)	0.14 (0.18)	– 0.12 (0.18)	0.38 (0.93)	– 2.44** (1.13)	– 0.37 (0.39)	14.97*** (1.52)
Countries do too little												
Yes	0.34*** (0.10)	0.08 (0.09)	0.58** (0.25)	1.50** (0.77)	0.16 (0.21)	1.43* (0.74)	0.53*** (0.12)	0.06 (0.11)	1.70*** (0.31)	1.20 (0.82)	0.59*** (0.22)	– 7.56*** (1.08)
Don't know/no answer	– 0.47* (0.26)	– 0.29 (0.24)	– 1.05 (0.69)	– 5.22*** (1.73)	– 0.90* (0.53)	– 4.52*** (1.30)	– 0.40 (0.49)	– 0.03 (0.43)	– 1.00 (0.89)	– 7.10*** (1.25)	0.25 (0.77)	– 33.12*** (2.50)
Pay higher prices												
Yes	0.27** (0.11)	– 0.11 (0.10)	0.40 (0.29)	3.55*** (0.97)	– 0.35 (0.22)	3.43*** (0.83)	0.41*** (0.12)	– 0.03 (0.10)	0.89** (0.38)	1.37 (1.19)	– 0.36 (0.24)	– 2.11** (0.88)
Don't know/no answer	0.18* (0.10)	0.02 (0.11)	0.31 (0.32)	– 5.81*** (0.86)	– 0.08 (0.25)	– 6.21*** (0.75)	0.41*** (0.12)	– 0.02 (0.11)	0.66 (0.41)	– 12.56*** (1.09)	– 0.31 (0.26)	2.09** (0.90)
Finance by national budget												
Yes	0.56*** (0.13)	0.14 (0.12)	1.17*** (0.28)	– 9.85*** (0.88)	0.30 (0.26)	– 10.26*** (0.79)	0.20 (0.13)	0.16 (0.13)	0.15 (0.38)	– 8.79*** (0.90)	0.23 (0.28)	6.45*** (0.81)
Don't know/no answer	0.24 (0.16)	– 0.08 (0.17)	0.49 (0.41)	– 1.99* (1.04)	– 0.23 (0.36)	– 2.46** (0.98)	0.08 (0.16)	0.07 (0.16)	0.02 (0.45)	1.65* (0.95)	0.05 (0.38)	0.20 (0.90)
Environmental awareness												
High awareness	0.19*** (0.02)	0.08*** (0.02)	0.39 (0.06)	4.06*** (0.23)	0.15*** (0.05)	3.34*** (0.19)	0.25*** (0.03)	0.04* (0.02)	0.53*** (0.09)	3.72*** (0.20)	0.10** (0.05)	2.52*** (0.21)
Don't know/no answer	0.69** (0.30)	– 0.06 (0.25)	– 0.05 (0.60)	6.44*** (1.36)	– 0.23 (0.59)	5.33*** (1.20)	0.83** (0.35)	0.57* (0.32)	1.38 (0.96)	5.36*** (1.32)	1.02 (0.79)	2.36 (1.51)
Conservative	– 0.08 (0.10)	0.04 (0.09)	– 0.39 (0.27)	– 0.07 (0.72)	0.19 (0.21)	– 0.33 (0.61)	0.17 (0.12)	0.00 (0.09)	0.31 (0.42)	2.46*** (0.75)	0.14 (0.22)	6.30*** (0.95)
Green	0.25** (0.10)	– 0.15* (0.09)	0.53* (0.30)	1.84** (0.81)	– 0.13 (0.20)	0.97 (0.72)	0.14 (0.11)	– 0.27*** (0.09)	0.14 (0.43)	3.18** (1.45)	– 0.30 (0.20)	9.37*** (0.86)
Social	– 0.00 (0.10)	0.01 (0.09)	0.20 (0.24)	1.15 (0.75)	0.27 (0.20)	0.36 (0.65)	0.18* (0.10)	0.21** (0.10)	0.82** (0.32)	– 2.82*** (0.93)	0.25 (0.21)	– 10.83*** (0.98)
Liberal	0.10 (0.09)	0.09 (0.08)	0.20 (0.26)	– 3.31*** (0.59)	0.09 (0.19)	– 3.03*** (0.53)	– 0.05 (0.09)	0.12 (0.08)	0.10 (0.31)	– 5.12*** (0.91)	0.17 (0.19)	0.38 (0.86)
Income												
High individual income	– 0.29*** (0.10)	– 0.16* (0.09)	– 0.83*** (0.28)	– 1.65*** (0.59)	– 0.31 (0.19)	– 0.84 (0.54)	– 0.04 (0.10)	– 0.05 (0.09)	0.43 (0.36)	– 1.66** (0.72)	0.04 (0.20)	– 8.57*** (0.92)
Don't know/no answer	– 0.15 (0.11)	0.13 (0.11)	– 0.28 (0.31)	– 14.32*** (0.76)	0.14 (0.25)	– 12.04*** (0.73)	0.12 (0.12)	0.37*** (0.12)	0.39 (0.41)	– 14.49*** (0.83)	0.74*** (0.28)	– 26.99*** (0.96)
Highly educated	0.03 (0.09)	– 0.02 (0.08)	0.18 (0.24)	1.88*** (0.63)	0.08 (0.18)	1.76*** (0.65)	– 0.10 (0.10)	– 0.21** (0.08)	– 0.06 (0.34)	3.07*** (0.87)	– 0.42** (0.20)	9.65*** (0.86)
Age	– 0.00 (0.00)	0.01** (0.00)	– 0.01 (0.01)	– 0.38*** (0.03)	0.02*** (0.01)	– 0.32*** (0.03)	0.01*** (0.00)	0.01*** (0.00)	0.03** (0.01)	– 0.25*** (0.03)	0.02** (0.01)	– 0.64*** (0.03)
Female	– 0.05 (0.09)	0.25*** (0.08)	– 0.17 (0.24)	– 0.52 (0.64)	0.43** (0.18)	0.71 (0.60)	– 0.02 (0.09)	0.38*** (0.08)	0.05 (0.30)	1.82** (0.77)	0.52*** (0.19)	– 3.70*** (0.73)
Own children	0.08* (0.04)	– 0.00 (0.04)	0.17 (0.12)	1.20*** (0.24)	– 0.15* (0.08)	0.80*** (0.21)	– 0.01 (0.05)	– 0.03 (0.04)	– 0.00 (0.18)	1.57*** (0.31)	– 0.03 (0.10)	7.10*** (0.34)
Regional controls												
North	– 0.02 (0.11)	0.22* (0.11)	0.24 (0.34)	4.57*** (0.75)	0.15 (0.26)	3.32*** (0.66)	– 0.17 (0.13)	0.13 (0.11)	– 0.70 (0.44)	6.27*** (0.82)	0.23 (0.28)	8.39*** (1.03)
East	0.07	0.10	– 0.08	9.77*** (0.24)	– 0.21 (0.08)	8.62*** (0.21)	0.12 (0.05)	0.05	0.07	10.28*** (0.31)	– 0.14 (0.10)	7.95*** (0.34)

	(0.12)	(0.11)	(0.31)	(1.21)	(0.24)	(1.10)	(0.13)	(0.11)	(0.40)	(1.24)	(0.25)	(1.50)
South	0.14	0.03	0.45	3.84***	- 0.13	2.44***	0.15	- 0.01	0.22	3.98***	- 0.19	12.46***
	(0.10)	(0.09)	(0.28)	(0.79)	(0.21)	(0.71)	(0.11)	(0.09)	(0.36)	(0.77)	(0.22)	(1.08)
Rho/constant	0.45***		- 2.90***	- 37.22***	- 1.02	- 28.57***	0.42***		- 4.72***	- 34.63***	- 1.09*	- 33.01***
	(0.05)		(0.86)	(2.57)	(0.67)	(2.17)	(0.05)		(0.88)	(2.48)	(0.66)	(2.76)
Observations	884		985		984		870		970		973	

Notes: Maximum likelihood estimates (robust standard errors) of the parameters in bivariate ordered probit and multinomial logit models. In the multinomial logit model, HAM = high acceptance of mitigation, HAA = high acceptance of adaptation, and CCD = climate change deniers.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

Table 5
Estimation results for the acceptance of national and international climate policy in the U.S.

Variables	Acceptance of national efforts				Importance in international climate negotiations							
	Bivariate ordered probit models				Multinomial logit models				Multinomial logit models			
	Mitigation	Adaptation	HAM	CCD	HAA	CCD	Mitigation	Adaptation	HIM	CCD	HIA	CCD
Humans responsible												
Yes	0.40*** (0.15)	0.05 (0.15)	0.55* (0.29)	16.98*** (3.78)	0.17 (0.28)	15.70*** (5.00)	0.33** (0.15)	0.03 (0.16)	0.74** (0.31)	75.87*** (3.88)	0.18 (0.31)	75.22*** (3.65)
Don't know/no answer	0.41* (0.22)	0.11 (0.26)	0.06 (0.69)	166.61*** (5.48)	– 0.13 (0.68)	165.92*** (5.95)	0.68** (0.28)	0.03 (0.26)	1.19* (0.69)	273.92*** (6.96)	0.25 (0.59)	279.73*** (6.88)
Limit climate change												
Yes	0.17 (0.11)	– 0.10 (0.11)	0.50** (0.25)	1.20 (5.71)	– 0.10 (0.23)	– 2.91 (5.32)	0.14 (0.11)	– 0.15 (0.12)	0.05 (0.28)	– 27.48*** (3.43)	– 0.28 (0.26)	– 20.65*** (6.45)
Don't know/no answer	0.22* (0.12)	0.09 (0.12)	0.58** (0.29)	132.25*** (5.05)	– 0.09 (0.26)	133.40*** (4.07)	0.06 (0.13)	– 0.14 (0.13)	– 0.13 (0.35)	161.86*** (3.26)	– 0.19 (0.31)	175.16*** (5.26)
Positive impact on economy												
Yes	0.30*** (0.10)	0.33*** (0.10)	0.83*** (0.22)	– 55.06*** (1.87)	0.83*** (0.20)	– 55.41*** (1.79)	0.30*** (0.10)	0.44*** (0.10)	0.44* (0.26)	– 73.54*** (2.46)	0.82*** (0.23)	– 76.71*** (2.24)
Don't know/no answer	0.32 (0.29)	0.47* (0.26)	0.76 (0.59)	– 14.31*** (4.26)	0.93** (0.47)	– 12.67*** (3.03)	0.34 (0.26)	0.27 (0.25)	0.68 (0.73)	– 95.01*** (3.65)	0.20 (0.55)	– 91.86*** (7.04)
Countries do too little												
Yes	0.37*** (0.09)	0.29*** (0.09)	0.56*** (0.21)	3.63** (1.69)	0.45** (0.19)	4.11*** (1.05)	0.29*** (0.10)	– 0.02 (0.09)	0.67*** (0.24)	26.46*** (0.99)	– 0.04 (0.22)	24.83*** (1.80)
Don't know/no answer	0.20 (0.23)	0.28 (0.20)	0.38 (0.47)	5.75 (3.87)	0.51 (0.43)	5.44* (2.81)	0.10 (0.19)	– 0.01 (0.22)	0.68 (0.56)	94.00*** (2.97)	0.28 (0.56)	89.62*** (7.08)
Pay higher prices												
Yes	0.16 (0.12)	0.04 (0.12)	0.20 (0.29)	– 10.78*** (1.38)	0.16 (0.23)	– 6.35*** (2.26)	0.38*** (0.13)	0.21* (0.12)	0.95*** (0.35)	– 10.94*** (2.09)	0.64** (0.28)	– 14.82*** (1.73)
Don't know/no answer	0.02 (0.12)	– 0.01 (0.11)	– 0.17 (0.28)	– 21.97*** (0.94)	– 0.09 (0.24)	– 23.19*** (1.13)	0.05 (0.12)	– 0.02 (0.12)	0.24 (0.33)	– 46.26*** (1.50)	0.12 (0.28)	– 50.21*** (1.58)
Finance by national budget												
Yes	0.46*** (0.18)	0.18 (0.18)	0.66** (0.25)	– 22.06*** (2.06)	0.25 (0.25)	– 20.36*** (2.06)	0.56*** (0.12)	0.48*** (0.12)	0.89*** (0.33)	– 33.25*** (1.50)	0.73** (0.28)	– 33.63*** (1.58)

Don't know/no answer	(0.14) 0.21 (0.13)	(0.13) 0.11 (0.13)	(0.29) 0.55* (0.31)	(1.72) – 6.36*** (2.31)	(0.25) 0.35 (0.27)	(1.74) – 3.07 (2.39)	(0.13) 0.43*** (0.14)	(0.13) 0.43*** (0.14)	(0.32) 1.19*** (0.38)	(2.37) 10.81*** (1.26)	(0.29) 0.88*** (0.31)	(2.48) 12.67*** (1.81)
Environmental awareness												
High awareness	(0.15)*** 0.69 (0.49)	0.03 (0.03) (0.50)	0.37*** (0.06) (0.78)	7.98*** (0.36) (2.14)	0.12** (0.05) (0.85)	7.87*** (0.37) (2.19)	0.20*** (0.03) (0.14)	0.12*** (0.03) –	0.58*** (0.08) (0.97)	7.64*** (0.38) (2.57)	0.34*** (0.07) (0.81)	8.01*** (0.44) (2.88)
Don't know/no answer	0.08 (0.10)	0.10 (0.09)	0.28 (0.22)	12.25*** (1.83)	0.28 (0.19)	13.06*** (1.46)	–	0.19** (0.10)	0.33 (0.26)	5.00*** (1.92)	0.26 (0.22)	7.04*** (2.76)
Conservative	0.24* (0.13)	0.19 (0.12)	0.34 (0.30)	7.11** (2.83)	0.16 (0.24)	3.63 (2.65)	0.05 (0.13)	–0.01 (0.12)	–0.26 (0.37)	45.15*** (2.47)	–0.22 (0.28)	41.98*** (5.40)
Green	–0.09 (0.11)	–0.03 (0.10)	–0.31 (0.25)	–7.97*** (1.10)	–0.00 (0.21)	–9.09*** (1.71)	0.21* (0.11)	0.15 (0.10)	0.17 (0.31)	20.37*** (1.16)	0.33 (0.26)	20.30*** (1.61)
Social	0.12 (0.10)	0.24** (0.10)	0.02 (0.23)	16.10*** (1.55)	0.23 (0.20)	15.76*** (1.00)	0.22** (0.11)	0.08 (0.10)	0.42 (0.34)	3.99*** (1.32)	0.15 (0.24)	2.82*** (1.01)
Liberal												
Income												
High individual income	0.02 (0.09)	0.07 (0.09)	–0.01 (0.22)	–7.11*** (1.72)	0.10 (0.19)	–5.37*** (1.37)	0.07 (0.10)	–0.08 (0.10)	0.12 (0.26)	–2.02* (1.04)	–0.27 (0.22)	–3.34** (1.47)
Don't know/no answer	0.20 (0.16)	0.24 (0.15)	–0.20 (0.35)	22.60*** (1.84)	0.36 (0.31)	25.86*** (2.37)	0.20 (0.15)	0.08 (0.13)	0.48 (0.42)	54.08*** (1.84)	0.22 (0.35)	60.02*** (3.89)
Highly educated	–0.04 (0.09)	0.03 (0.09)	0.14 (0.21)	–2.72*** (0.77)	0.40** (0.18)	–2.24*** (0.80)	0.11 (0.10)	0.12 (0.09)	0.46* (0.25)	4.50*** (1.41)	0.39* (0.22)	3.72*** (1.12)
Age	0.01** (0.00)	0.01** (0.00)	0.02*** (0.01)	0.04 (0.03)	0.01 (0.01)	0.03 (0.03)	0.01** (0.00)	0.01* (0.00)	0.03 (0.01)	–0.14*** (0.04)	0.03 (0.01)	–0.08 (0.06)
Female	0.02 (0.09)	0.17* (0.09)	–0.02 (0.21)	–28.97*** (1.47)	0.38*** (0.18)	–28.97*** (1.63)	0.22** (0.09)	0.22** (0.09)	0.36 (0.26)	–55.04*** (1.54)	0.25 (0.22)	–56.87*** (1.57)
Own children	0.03 (0.03)	–0.03 (0.03)	0.07 (0.07)	–1.06*** (0.30)	–0.03 (0.06)	–0.86** (0.34)	–0.04 (0.03)	–0.01 (0.03)	–0.16* (0.09)	1.82*** (0.40)	0.02 (0.07)	1.43** (0.57)
Regional controls												
West	–0.12 (0.11)	0.03 (0.11)	–0.42 (0.26)	24.65*** (3.20)	–0.07 (0.23)	25.86*** (1.48)	0.20* (0.12)	0.03 (0.11)	–0.36 (0.30)	8.50*** (1.73)	–0.04 (0.27)	7.55*** (0.87)
Midwest	–0.14 (0.11)	–0.20* (0.11)	–0.68*** (0.26)	20.54*** (1.14)	–0.26 (0.22)	20.02*** (1.93)	0.00 (0.12)	–0.14 (0.11)	–0.17 (0.31)	13.82*** (1.10)	–0.24 (0.26)	14.49*** (1.27)
Northeast	0.06 (0.12)	0.05 (0.12)	–0.14 (0.29)	26.11*** (2.24)	0.05 (0.25)	27.32*** (2.55)	0.12 (0.12)	0.20 (0.12)	0.12 (0.32)	3.67** (1.81)	0.53* (0.29)	5.44*** (1.37)
Rho/constant	0.70*** (0.06)		–3.38*** (0.56)	–223.13*** (7.78)	–2.12*** (0.47)	–226.34*** (7.43)	0.85*** (0.07)		–4.44*** (0.68)	–328.12*** (7.73)	–2.77*** (0.58)	–344.67*** (9.12)
Observations	741		964		957		729		953		945	

Notes: Maximum likelihood estimates (robust standard errors) of the parameters in bivariate ordered probit and multinomial logit models. In the multinomial logit model, HAM = high acceptance of mitigation, HAA = high acceptance of adaptation, and CCD = climate change deniers.

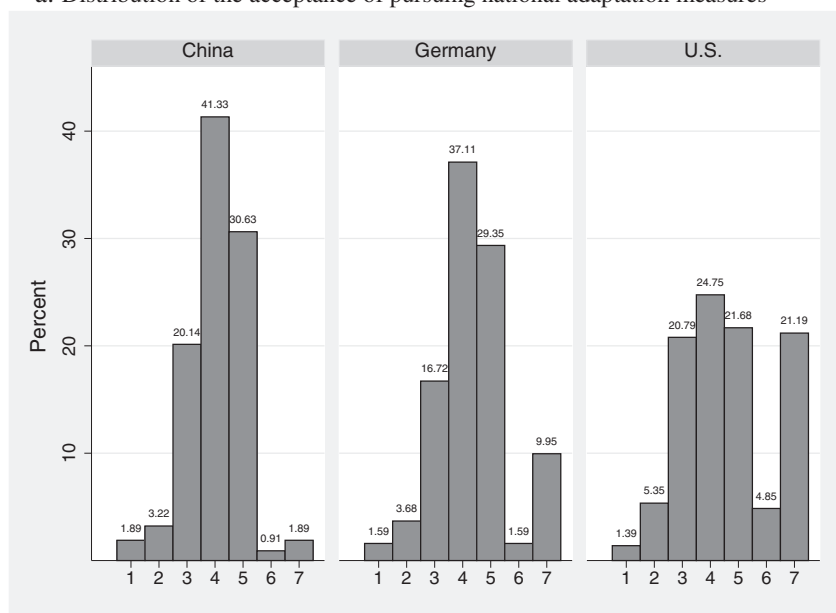
*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

Appendix B. Figures

a: Distribution of the acceptance of pursuing national adaptation measures



b: Distribution of the acceptance of pursuing national mitigation measures

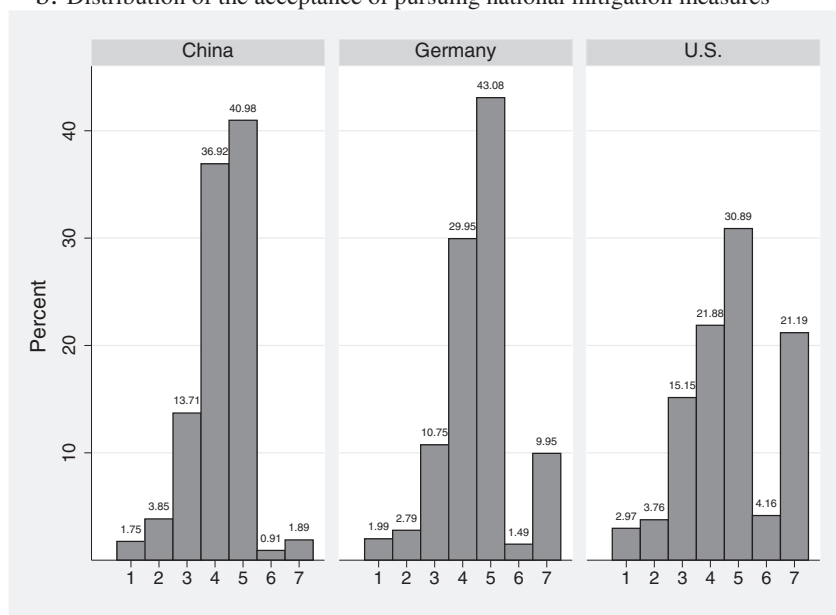
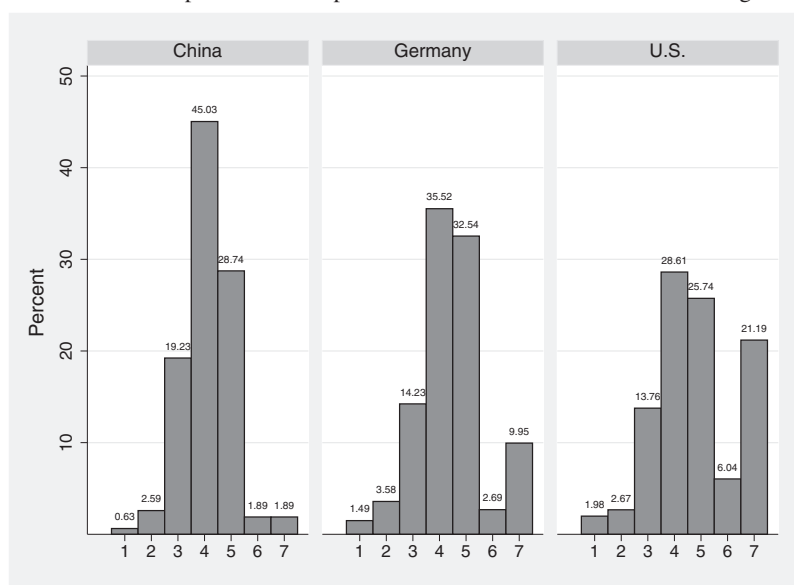


Fig. 1. a: Distribution of the acceptance of pursuing national adaptation measures.

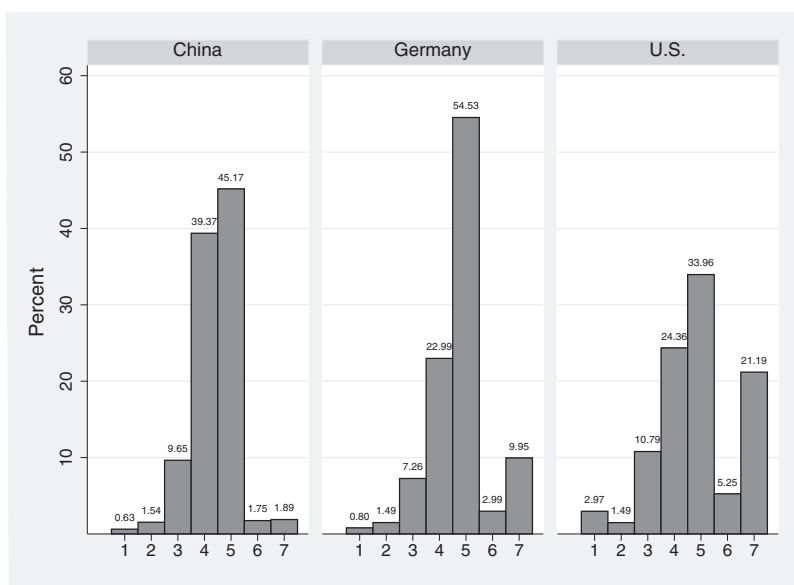
b: Distribution of the acceptance of pursuing national mitigation measures.

Note: 1 = very weakly, 2 = rather weakly, 3 = neither weakly nor strongly, 4 = rather strongly, 5 = very strongly, 6 = don't know/no answer, 7 = climate change deniers.

a: Distribution of importance of adaptation as issue in international climate negotiations



b: Distribution of importance of mitigation as issue in international climate negotiations

**Fig. 2.** a: Distribution of importance of adaptation as issue in international climate negotiations.

b: Distribution of importance of mitigation as issue in international climate negotiations.

Note: 1 = very unimportant, 2 = rather unimportant, 3 = neither important nor unimportant, 4 = rather important, 5 = very important, 6 = don't know/no answer, 7 = climate change deniers.

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